APPENDIX 10.

Hartley Gulch Subwatershed Agricultural TMDL Implementation Plan

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1.0 Executive Summary

Subwatershed: Hartley Gulch Subwatershed
Total Scope: 29,216 acres
Agricultural Scope: 10,546 acres
Agricultural Critical Acres Scope: 6,404 acres

Location: North side of the Boise River, located north of Caldwell in Canyon County

Priority Subwatershed: Medium

Cooperating Agricultural Agencies:
Canyon Soil Conservation District (CSCD)
Gem Soil and Water Conservation District (GSWCD)
Natural Resources Conservation Service (NRCS)
Idaho Soil Conservation Commission (ISCC)

Agricultural Land Uses:

Hartley Gulch Agricultural Land Uses

Landuse	Acres	Percent of Hartley Gulch Subwatershed
Sprinkler Irrigated Cropland, and Pasture	3,516	12%
Surface Irrigated Cropland	5,954	20%
Surface Irrigated Pasture	188	1%
Non-Irrigated Pasture	626	2%
CAFO/AFO	262	1%
TOTAL	10,546	36%

Major Agricultural Products: Seed corn, alfalfa and clover for seed and/or hay, beans, sugar beets, winter and spring wheat, sweet and field corn, barley, potatoes, onions, hops, specialty seed crops, vegetables, livestock, and dairy products.

TMDL Objectives: The Idaho Soil Conservation Commission (ISCC) has prepared this plan to implement the Total Maximum Daily Load (TMDL) for the Lower Boise River. The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the river. The TMDL establishes instream targets for total suspended solids (TSS) and bacteria and sets goals for reducing the loads of sediment and bacteria from the tributaries to the Lower Boise River in order to achieve the instream targets The instream targets are to be attained within the river near the cities of Middleton and Parma. The purpose of the instream TSS targets is to protect fish species that may be adversely impacted by instream TSS levels that exceed the concentration and duration components of the targets. The purpose of the bacteria target is to protect human health.

The TSS instream concentration is 50 mg/L for no more than 60 days, and 80 mg/L for no more than 14 days. To attain these durational instream concentration targets, the TMDL sets a sediment reduction goal of 37% at the mouth of the Hartley Gulch. The bacteria target requires a maximum geometric mean no greater than 50 CFU/100 mL based on a minimum of five samples taken over a thirty-day period (IDAPA 16.10.02.250.01.a). To attain this target, the TMDL seeks to reduce bacteria colonies in the river by 76% at Middleton and 93% at Parma, and calls for bacteria reduction goals for the tributaries ranging from 92% to 98%.

The TMDL does not establish nutrient targets for the Lower Boise River or nutrient reduction goals for the tributaries because there is no nutrient-caused impairment (i.e. excessive aquatic plant or algae growth) in the Lower Boise River. It is expected, however, that the TMDL for the Hells Canyon reach of the Snake River (RM 409 to RM 288 “SR-HC TMDL”) will establish nutrient-reduction goals for the Boise River and other tributaries and upstream sources to the SR-HC TMDL reach. In anticipation of a nutrient-reduction goal for the Boise River, the Lower Boise TMDL calls for no net increase (NNI) of current TP loads to the Lower Boise River.

Implementation Plan: This Implementation Plan identifies best management practices (BMPs) and prioritizes agricultural lands in Hartley Gulch Subwatershed for BMP implementation to achieve the TMDL's objectives within the Lower Boise River watershed. Proposed BMPs include, but are not limited to, sprinkler irrigation systems, surge irrigation systems, drip irrigation systems, sediment basins, filter strips, polyacrylamide (PAM) application, irrigation water management*****, pest management, nutrient management, conservation tillage, and livestock grazing management.

Three BMP installation alternatives are evaluated for each of the five different agricultural land use types (Treatment Units) within the Hartley Gulch Subwatershed. Estimated costs to install BMPs on lands identified for treatment are: Alternative 1 **-** $6,047,800; Alternative 2 **-** $3,882,800; and Alternative 3 **-** $2,135,500. These cost estimates do not include costs of acquiring necessary real property interests and permits, or annual operation and maintenance costs.

2.0 Introduction

The Hartley Gulch Subwatershed encompasses 29,216 acres. Hartley Gulch (as it is commonly referred to) originates in Gem County and flows southwest toward the Lower Boise River. Surface irrigation water starts at the "C" Line canal in Canyon County. Parts of Middleton are located within the Hartley Gulch Subwatershed boundary.

This implementation plan will address the nonpoint, agricultural sources of sediment, nutrients, and bacteria that impact the Lower Boise River from Hartley Gulch. Within this plan the following elements are identified: pollutant problems within Hartley Gulch, sources of those pollutants, critical acres contributing pollutants to the drain, priority areas for treatment, and Best Management Practices (BMPs) that, when applied, will have the greatest effect on improving water quality.

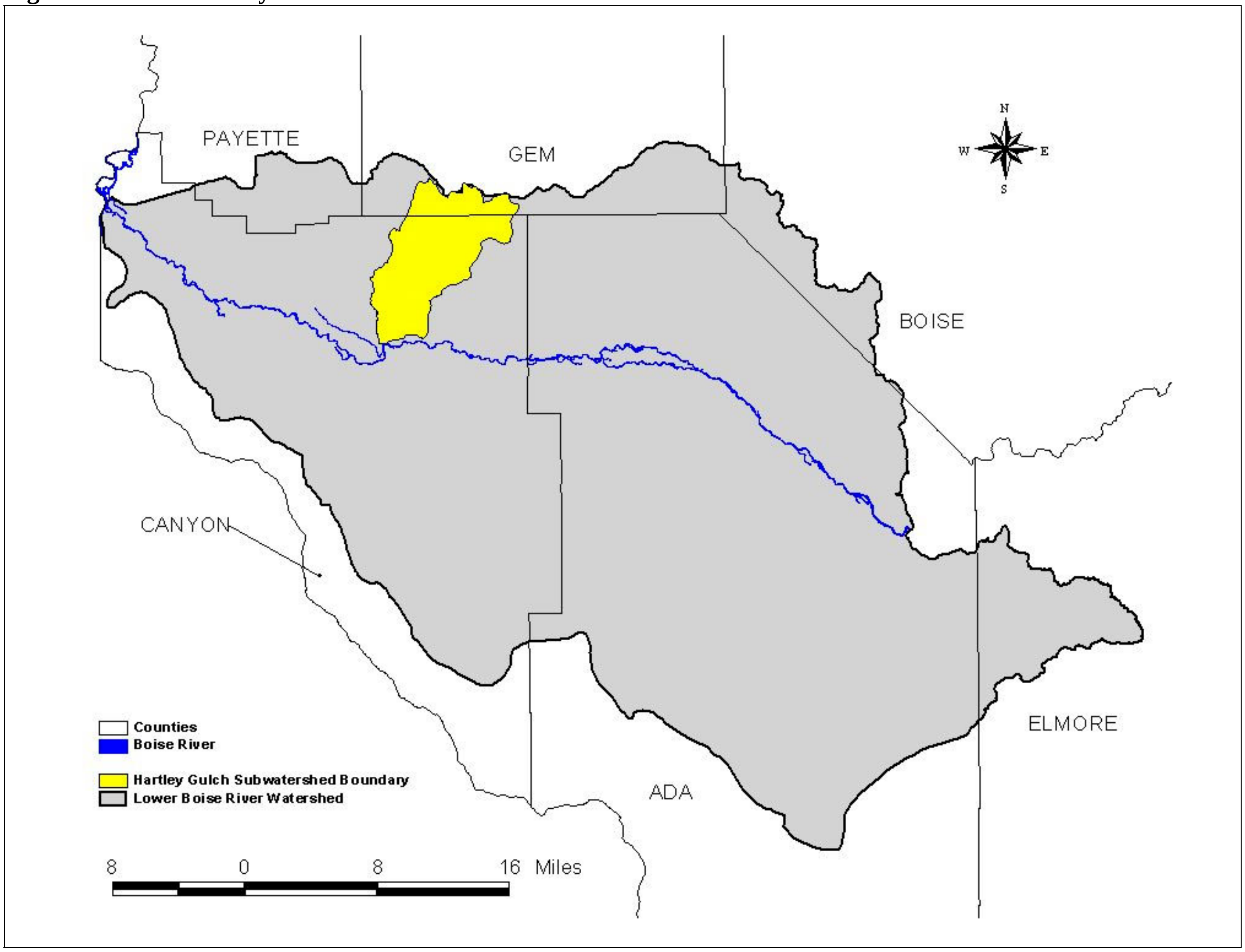
Efforts to gather additional bacteria, sediment, and nutrient data are either underway or planned. Information developed through these efforts may be used to revise the appropriate portions of the Implementation Plan, and determine and adjust appropriate implementation methods and control measures.

The costs to install BMPs on agricultural lands are estimated in this plan to provide the local community, government agencies, and watershed stakeholders some perspective on the economic demands of meeting the TMDL goals. Availability of cost-share funds to agricultural producers within the Hartley Gulch Subwatershed will be necessary for the success of this plan and the final reduction of pollutants necessary to meet the TMDL requirements at the mouth of Hartley Gulch. Sources of available funding and technical assistance for the installation of BMPs on private agricultural land are outlined in Appendix 2 of the Lower Boise River Agricultural Implementation Plan.

It is recommended that landowners within Hartley Gulch Subwatershed contact the Canyon Soil Conservation District (Canyon SCD), Gem Soil and Water Conservation District (Gem SWCD), the Natural Resources Conservation Service (NRCS), or the Idaho Soil Conservation Commission (ISCC) to help determine the need to address water quality and other natural resource concerns on their land. This plan is not intended to identify which specific BMPs are appropriate for specific properties, but rather provides a subwatershed approach for addressing water quality problems attributed to runoff from agricultural lands.

*** Irrigation Water Management (IWM) involves providing the correct amount of water at the right times to optimize crop yield, while at the same time protecting the environment from excess surface runoff and deep percolation. Irrigation water management includes techniques to manage irrigation system hardware for peak uniformity and efficiency as well as irrigation scheduling and soil moisture monitoring methods.**

Figure 1. Hartley Gulch Subwatershed Location



3.0 Watershed Characterization

This section describes watershed characteristics that affect the types, locations, and effectiveness of BMPs proposed in this implementation. These characteristics include soils, climate, surface hydrology, demographics and economics, ground water hydrology, and land ownership and land use in Hartley Gulch Subwatershed.

3.1 Soils

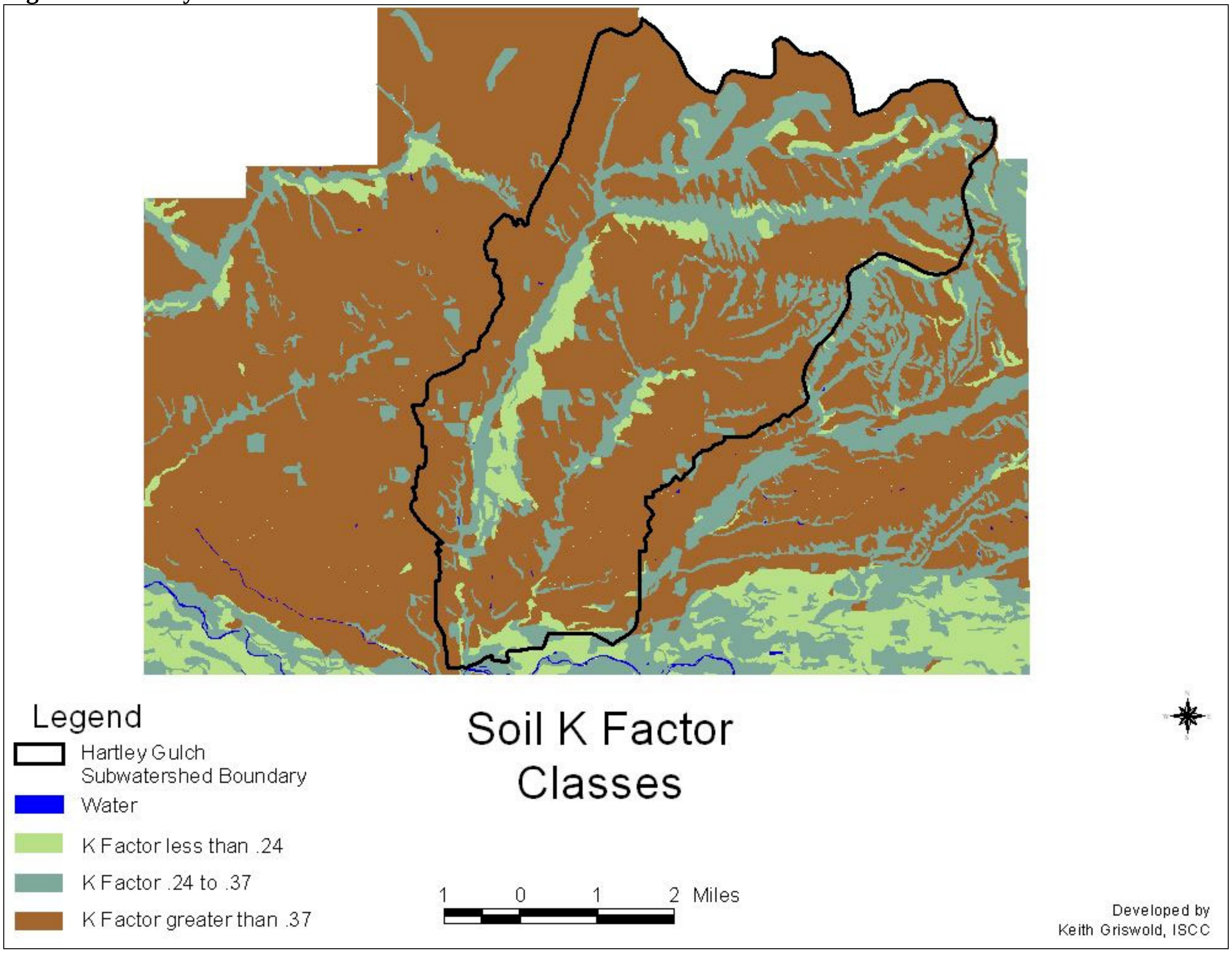
There are two major soil associations within Hartley Gulch Subwatershed (U. S. Department of the Agriculture, 1972).

- *Elijah-Lankbush-Chilcott-Lanktree:* Well drained soils on higher nearly level to rolling dissected alluvial fan terraces
- *Moulton-Bramt-Baldock-Falk:* Moderately well and poorly drained soils on floodplains and low river terraces

Due to the arid and temperate climate, soils generally have weakly developed profiles, are unleached, are alkaline and have a high natural fertility.

Figure 2. Shows the “K-Factor” of the soils within Hartley Gulch. “K-Factor” rating explains the erodibility of a soil. The higher the number, the greater the erosion potential.

Figure 2. Hartley Gulch Subwatershed K Factor Classes



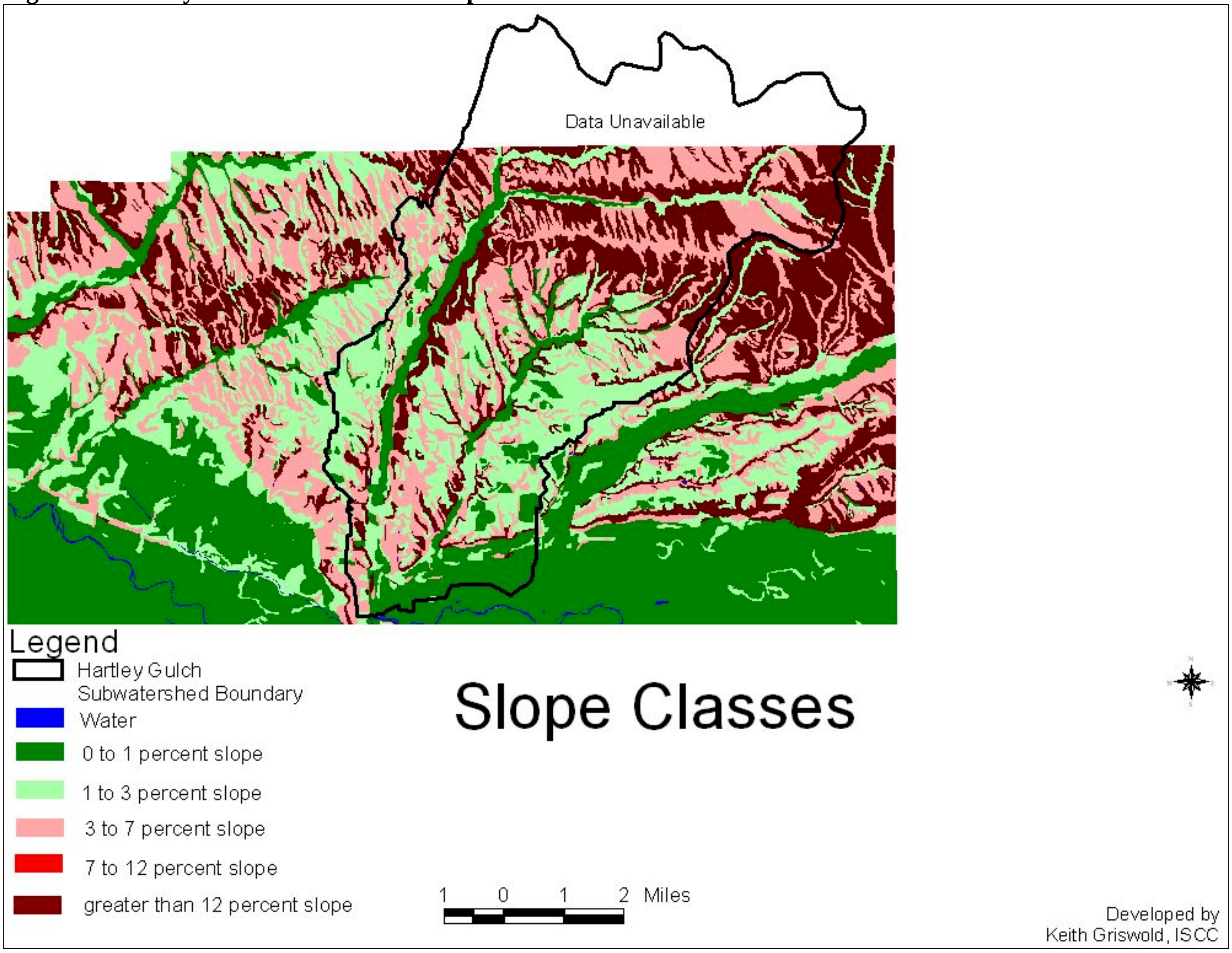
3.2 Climate

Climate in this area is characterized by cool, moist winters and hot, dry summers. The average daily maximum temperature in July for Caldwell, Idaho is 92 degrees Fahrenheit, while the average daily minimum temperature in January is 20 degrees Fahrenheit. Temperatures as low as -46 degrees Fahrenheit and as warm as 112 degrees Fahrenheit have been recorded.

Long term average annual precipitation for Caldwell is 10.48 inches. Approximately 57 percent of the yearly precipitation occurs during the November through March period. Average precipitation during the April to September growing season is less than 4 inches in the valley. Extended periods of no rain can occur frequently during the growing season.

The average consecutive frost-free period (above 32 degrees) is 143 days, based on the Caldwell long-term climatic data station. A probability analysis of the data shows 8 years in 10 will have a frost-free season of at least 125 days for this area. The average last frost (32 degrees) in the spring is around May 6 and the average first frost (32 degrees) in the fall is around September 27 (U. S. Department of the Agriculture, 1972).

Figure 3. Hartley Gulch Subwatershed Slope Classes



3.3 Surface Hydrology

The Hartley Gulch Subwatershed ranges in elevation from approximately 2,560 feet at the headwaters to 2,280 feet at the Boise River.

Pre-existing ephemeral channels have been modified over time by channelization and bank stabilization prior to the construction of irrigation and drainage systems for water delivery and drainage for croplands and pastures. There are currently 2 major canals or laterals that supply water to cropland in Hartley Gulch Subwatershed and 1 major drain that receive tailwater from the croplands and pastures or drain ground water (Table 1). Agricultural wells supply some water to the upper portions of the subwatershed.

Water supplies for Hartley Gulch come from two major systems. The upper portion of the subwatershed has water supplied by Black Canyon Irrigation water (Payette River). The lower portion of the subwatershed has water supplied by Boise River water.

Figure 4. Surface Hydrology

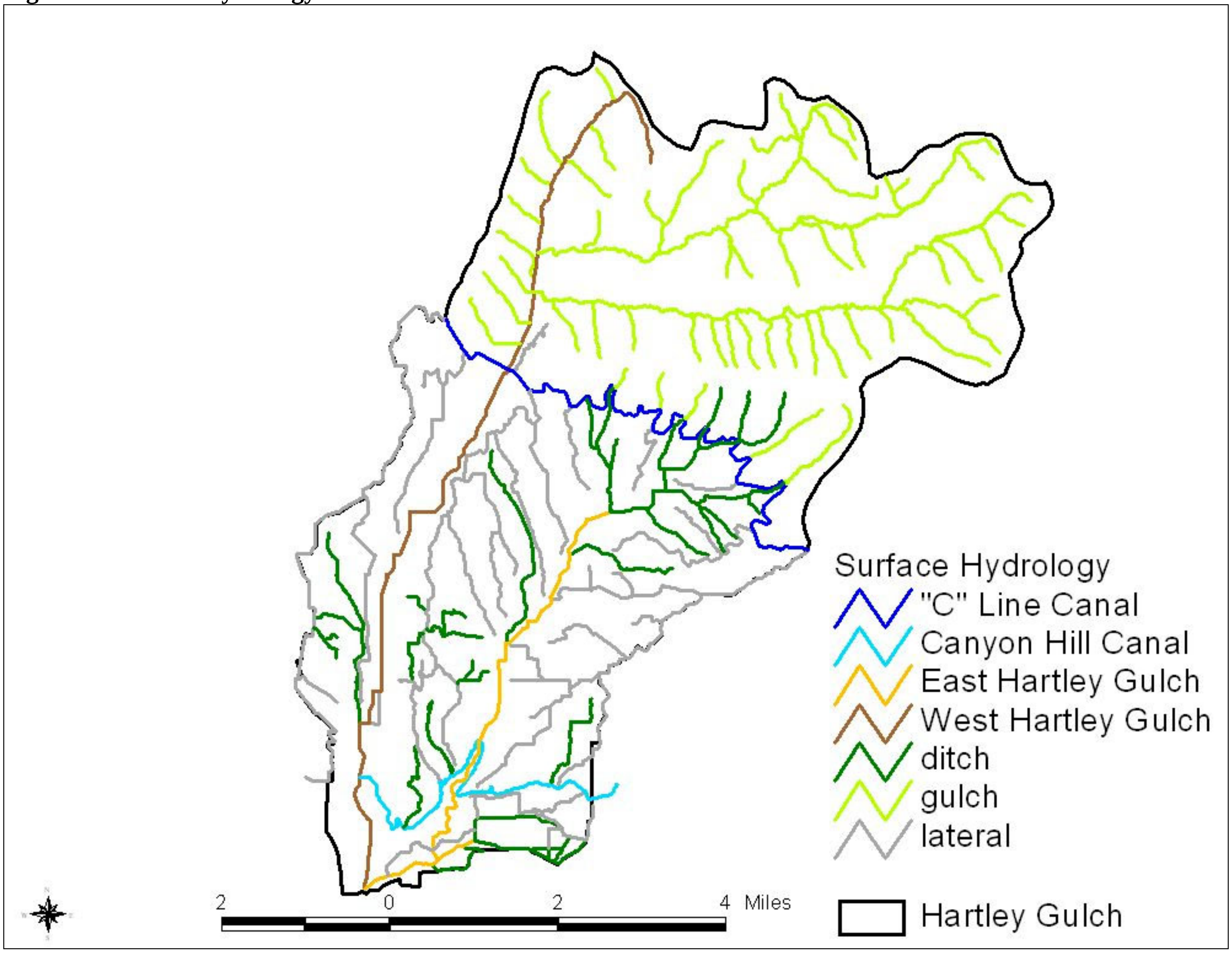
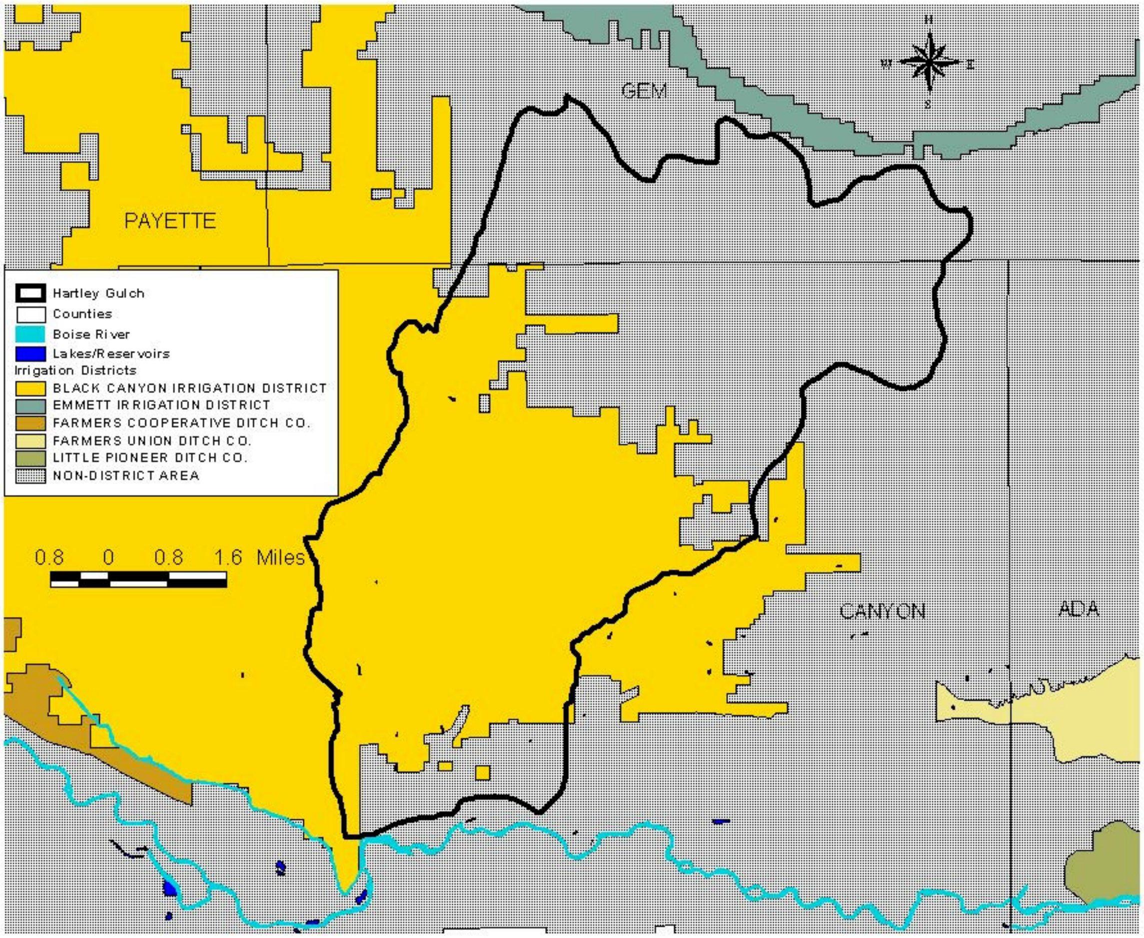


Table 1. Surface Waterbodies in Hartley Gulch Subwatershed

Canal, Lateral or Reservoir	Drain, Slough or Gulch
"C" Line Canal	West Hartley Gulch
Canyon Hill Canal	East Hartley Gulch

Figure 5. Irrigation Districts



3.4 Ground Water Hydrology

A large, shallow, aquifer (< 200 feet) is recharged annually by seepage from surface irrigation and conveyance of water through earthen canals. A deep aquifer exists under Hartley Gulch Subwatershed. The Boise Valley deep aquifer underlies the subwatershed.

3.5 Demographics and Economics

Demographic and Economic section is for all of Canyon County.

- Population of Canyon County increased from 90,076 in 1990 to 116,675 in 1997.
- Types of irrigated crops include, but are not limited to: seed corn, alfalfa and clover for seed and hay, beans, sugar beets, winter and spring wheat, sweet and field corn, barley, potatoes, onions, hops, specialty seed crops and vegetables.

Table 2. 2001 Agricultural Data for Hartley Gulch Subwatershed

Inventory: Farms & Cropland	Hartley Gulch Subwatershed
Total # of Farms	185
Total Acres of Farms	10,546
Average Farm Size (acres)	57.0
Total Acres in Crops	10,284

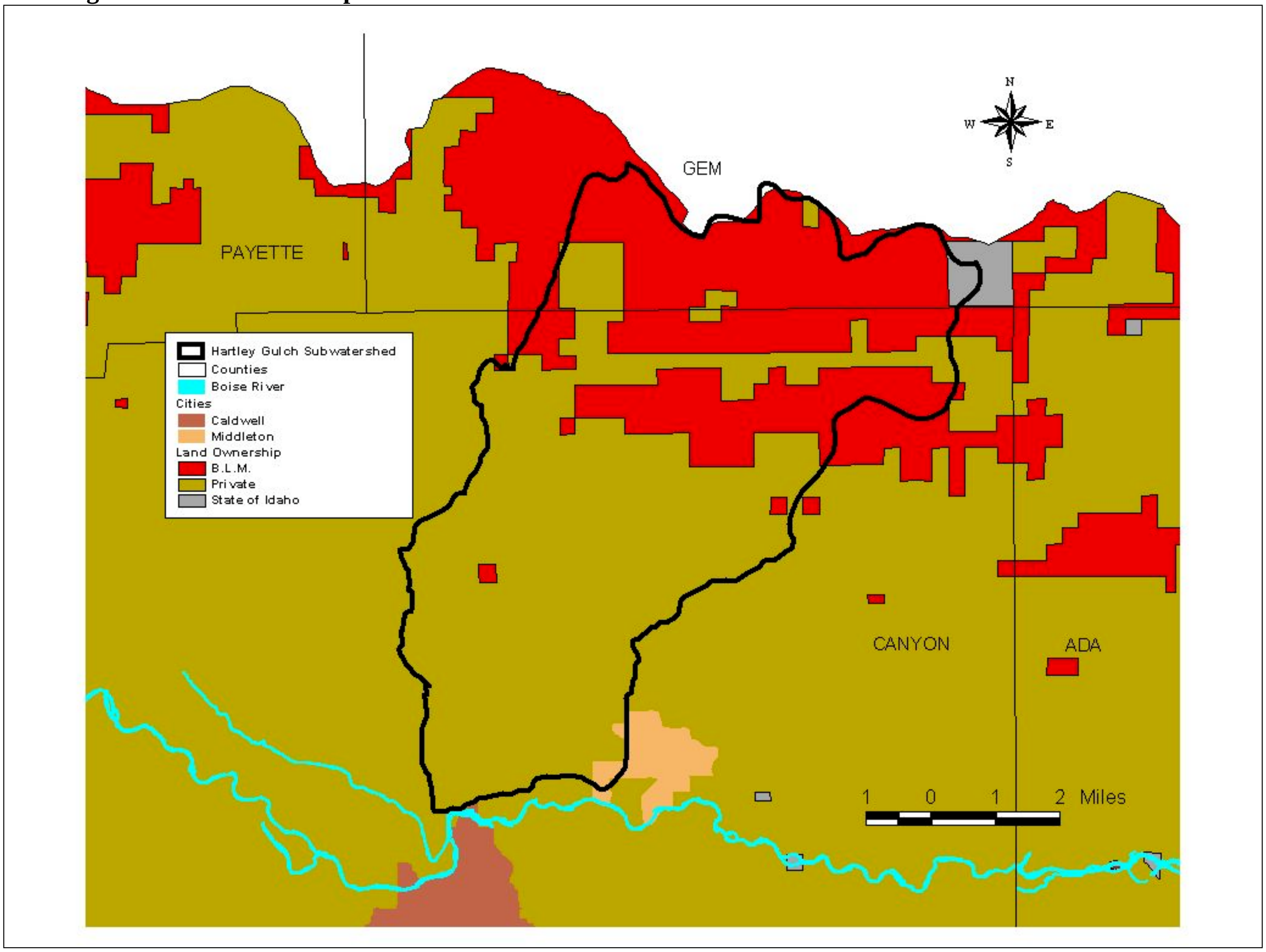
(Griswold, 2001) "Farm"--- A tract of land according to Farm Service Agency delineation, a minimum of 20 acres.

3.6 Land Ownership and Land Use

The items listed below are highlights of the Land Ownership and Land Use section in the Lower Boise River Implementation Plan.

- Hartley Gulch Subwatershed is 65% privately owned (Figure 6).
- Irrigated crops are the largest agricultural use

Figure 6. Land Ownership



4.0 Treatment Units

This section presents information on the individual agricultural land uses within the watershed. Each land use is divided into one or more Treatment Units (TUs) (Figure 7). The TUs describe areas with similar use, management, soils, productivity, resource concerns, and treatment needs. The TUs not only provide a method for delineating and describing land use but are also used in evaluating land use impacts to water quality and in the formulation of alternatives for solving the identified problems.

The descriptions in this section are intended to provide a general overview of the TUs.

- <u>Treatment Unit #1 – Sprinkler Irrigated Cropland, and Pasture 3,516 acres</u>

  This unit is located throughout the subwatershed. Typical cropping sequence is alfalfa hay, row crops and grain. Row crops include potatoes, sugar beets, mint, and corn. This area has little or no impact on Lower Boise River water quality because of high irrigation efficiencies resulting in insignificant amount of runoff.

- <u>Treatment Unit #2 – Surface Irrigated Cropland, 5,954 acres</u>

  Surface irrigation occurs on silt loam and loam soils on slopes from 0-12%, with the majority of the cropland less than 3% slope. Typical cropping sequence is alfalfa seed or hay, row crops, and grain. Row crops include potatoes, sugar beets, beans, onions, and corn. Most of the wastewater enters an extensive system of low gradient excavated drain ditches or canals.

- <u>Treatment Unit #3 – Surface Irrigated Pasture 188 acres</u>

  Surface irrigated pastures are characterized by silt loam soils with slopes ranging from 0-12% with the majority of pastures less than 3% slope. Pastures are typically grazed throughout much of the season (Spring-Fall) with little re-growth allowed in the Fall. Some pastures are used for feeding areas for large herds of livestock during the winter. Wastewater runoff from the surface irrigated pastures enters the Lower Boise River via Hartley Gulch.

- <u>Treatment Unit #4 – Non-Irrigated Pasture 626 acres</u>

  Non-Irrigated pasture occurs mostly at the upper end of the watershed.

- <u>Treatment Unit #5-- CAFO/AFO 262 acres (24 units)</u>

  Feedlots are small and generally occupied by cattle during the winter and spring months (November through April), with most located on farmsteads. See Table 5. Dairies and feedlots are under regulations or strict recommendations to eliminate runoff up to a 25 year, 24 hour storm events as well as average 5-year runoff rates from the feeding and milking facilities. Where animal wastes are applied to croplands, existing State and NRCS standards are required for dairy operators.

  As required by Idaho State Law, all producing and selling dairy facilities have submitted a Nutrient Management Plan submitted to Idaho Department of Agriculture.

Table 3. Acres of TUs within Hartley Gulch Subwatershed.

Treatment Units	Acres
Treatment Unit 1	3,516
Treatment Unit 2	5,954
Treatment Unit 3	188
Treatment Unit 4	626
Treatment Unit 5	262
TOTAL	10,546

(Griswold, 2001)

Figure 7. Treatment Units

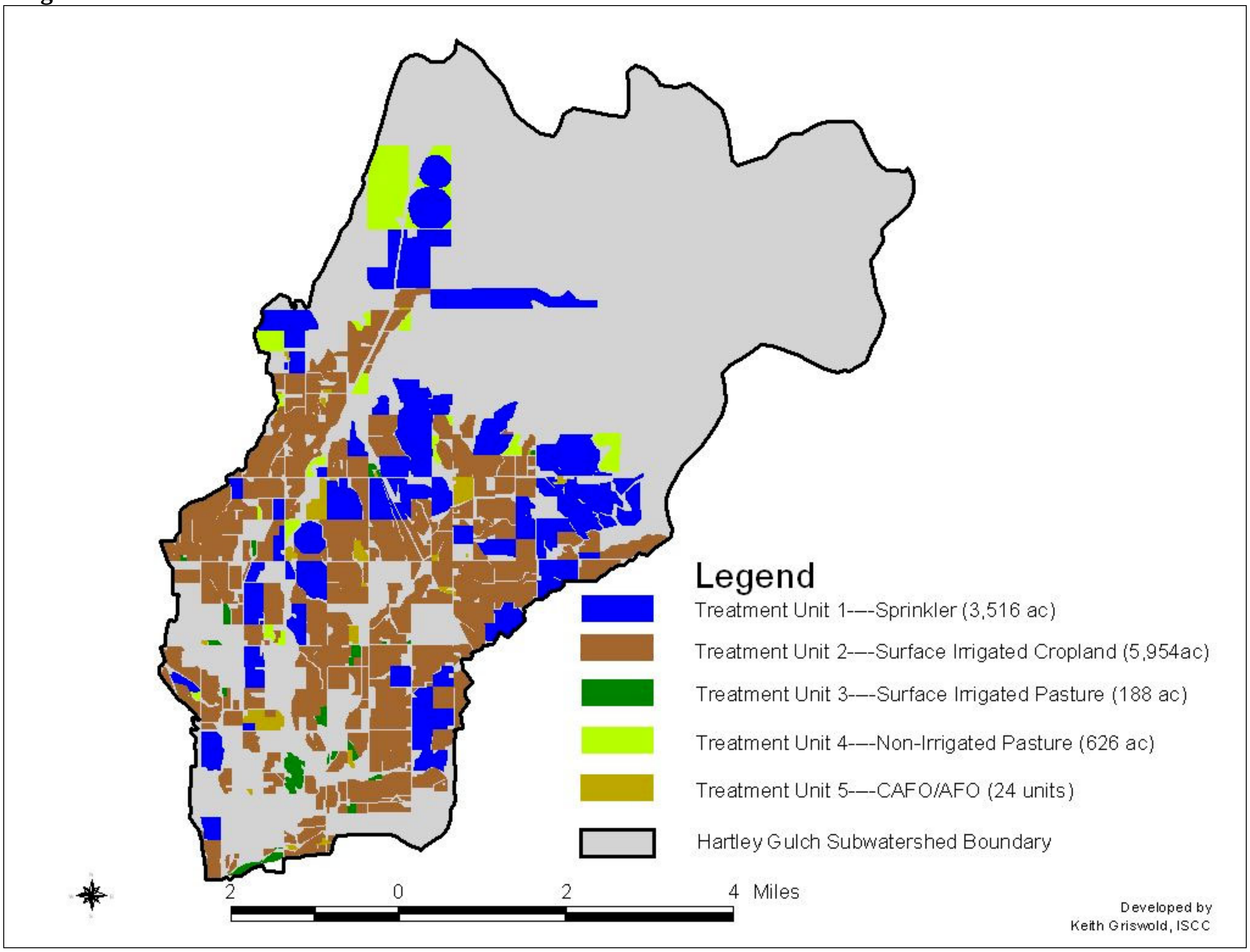
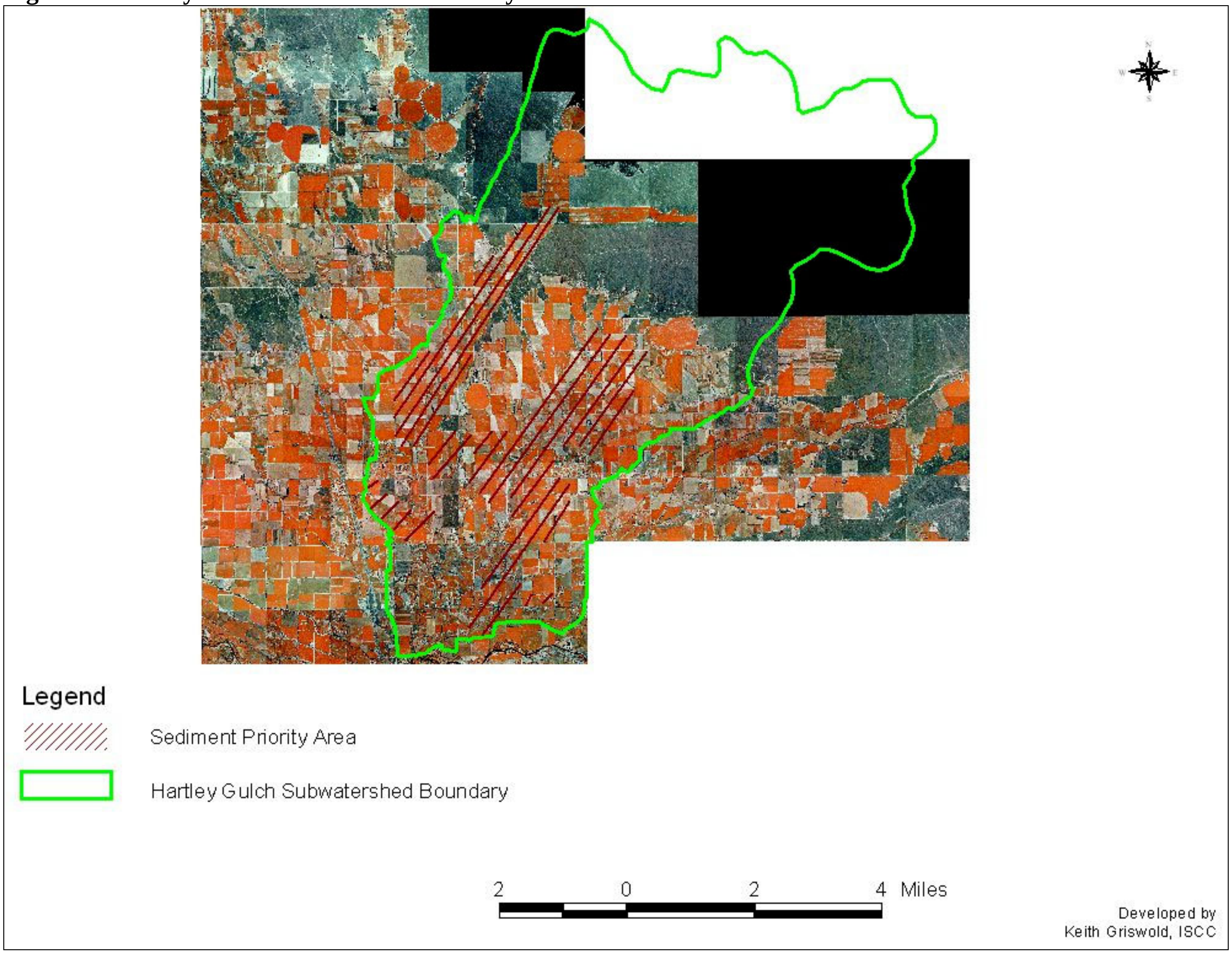


Figure 8. Hartley Gulch Subwatershed Priority Area



5.0 TMDL Objectives

The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the Lower Boise River. To support aquatic life and recreational uses, the TMDL seeks to meet state bacteria criteria and a Total Suspended Sediment (TSS) target in the Boise River by establishing "load" reduction goals for several drains or tributaries to the Lower Boise River, including Hartley Gulch.

The TMDL recognizes that the targets and load reductions may be revised as additional data is collected, as understanding of water quality in the river improves, and as state water quality standards change. After the TMDL targets and load reductions were established for sediment and bacteria, additional, more frequent sediment data have been collected, the State of Idaho's bacteria criteria has changed, and a DNA analysis of bacteria to determine bacteria sources has been performed. This new information and water quality standards change indicate that revision of the TMDL sediment and bacteria targets is appropriate, and will continue to be evaluated with additional data as it is collected.

While there is no nutrient-caused impairment of the Lower Boise River, IDEQ expects to require nutrient load reductions in the Lower Boise River watershed to reduce algae production in the Snake River as part of the Snake River – Hells Canyon (SR-HC) TMDL. The SR-HC TMDL is due to be submitted to EPA at the end of 2001. After EPA approval, IDEQ will expect the Lower Boise River Watershed Advisory Group (WAG) to identify actions necessary to meet the new load reduction targets at the mouth of the Lower Boise River. Until then, this implementation plan will be based on IDEQ's "No Net Increase" in nutrients policy for the Lower Boise River.

Agricultural sources of sediment, bacteria and nutrients include surface irrigated cropland and pastures, animal feedlots, livestock grazing waterways and ditch maintenance**.** BMPs can be implemented to address the following:

- Irrigation induced erosion.
- Lack of adequate vegetation adjacent to waterways necessary for removing sediment, nutrients, and pathogens from runoff.
- Animal feedlots in and adjacent to waterways delivering excess sediment, nutrients, and bacteria.

5.1 Recreational Uses – Bacteria Objectives

The TMDL establishes a 98% bacteria reduction objective for the Hartley Gulch to meet Idaho's fecal coliform criteria for protection of recreational uses (Table 4).

Table 4. Reductions Required to Meet Bacteria Load Allocation

Name	Primary Geo-Mean CFU/100 ml	Primary Load Allocation CFU/100 ml geometric mean	Primary Percent Reduction	Secondary Geo-Mean CFU/100 ml	Secondary Load Allocation CFU/100 ml geometric mean	Secondary Percent Reduction
Hartley Gulch	**2296**	**50**	**98%**	**565**	**200**	**65%**

(portion of Table 22 from, page 71 Lower Boise River TMDL Subbasin Assessment)

Two developments affect this reduction objective and agricultural BMP implemention required to meet it. Idaho's bacteria criteria was changed from fecal coliform to E. Coli (Escherichia coli). Data show that Lower Boise E. Coli levels do not exceed the new criteria. In addition, DNA analysis of bacteria samples from various locations in the Lower Boise River watershed show that natural sources of bacteria (e.g. birds, ducks, geese, deer, rodents, raccoon) that are beyond human control prevent attainment of the TMDL's bacteria targets and load reductions. It is likely that inputs of bacteria from cows can be reduced by simply limiting their access to the Boise River and tributary water sources.

Table 5. Description of Confined Animal Feeding Operations in Hartley Gulch Subwatershed

Type of Confined Animal Feeding Operation (CAFO)	Number of CAFO's in Hartley Gulch Subwatershed
Dairy Cattle	11
Beef Cattle	4
Horse	7
Emu	1
Sheep	1
Total	**24**

(Griswold, 2001)

5.2 Aquatic Life Uses – Sediment Objectives

The approach is to seek voluntary implementation of best management practices (BMPs) on agricultural lands to reduce Total Suspended Sediment loading rate by 37%.

Table 6. 1995 TSS loads and allocations for Hartley Gulch

Tributary	1995 Loads	% of Total River Load	TSS Load Goals	% of Total Goal
Hartley Gulch	8.4	5%	5.3	3%

(IDEQ, 1998)

5.3 Aquatic Life Uses – Phosphorus Objectives

As per the *Lower Boise River TMDL Subbasin Assessment*, total phosphorus is subject to a No Net Increase (NNI) temporary recommendation until IDEQ establishes its SR-HC phosphorus TMDL.

Table 7. Proposed No Net Increase (NNI) Phosphorous Load

Tributary Name	Seasonal Average TP Load, lbs/day	Seasonal Total Load, lbs
Hartley Gulch	**136**	**25009**

(IDEQ, 1998)

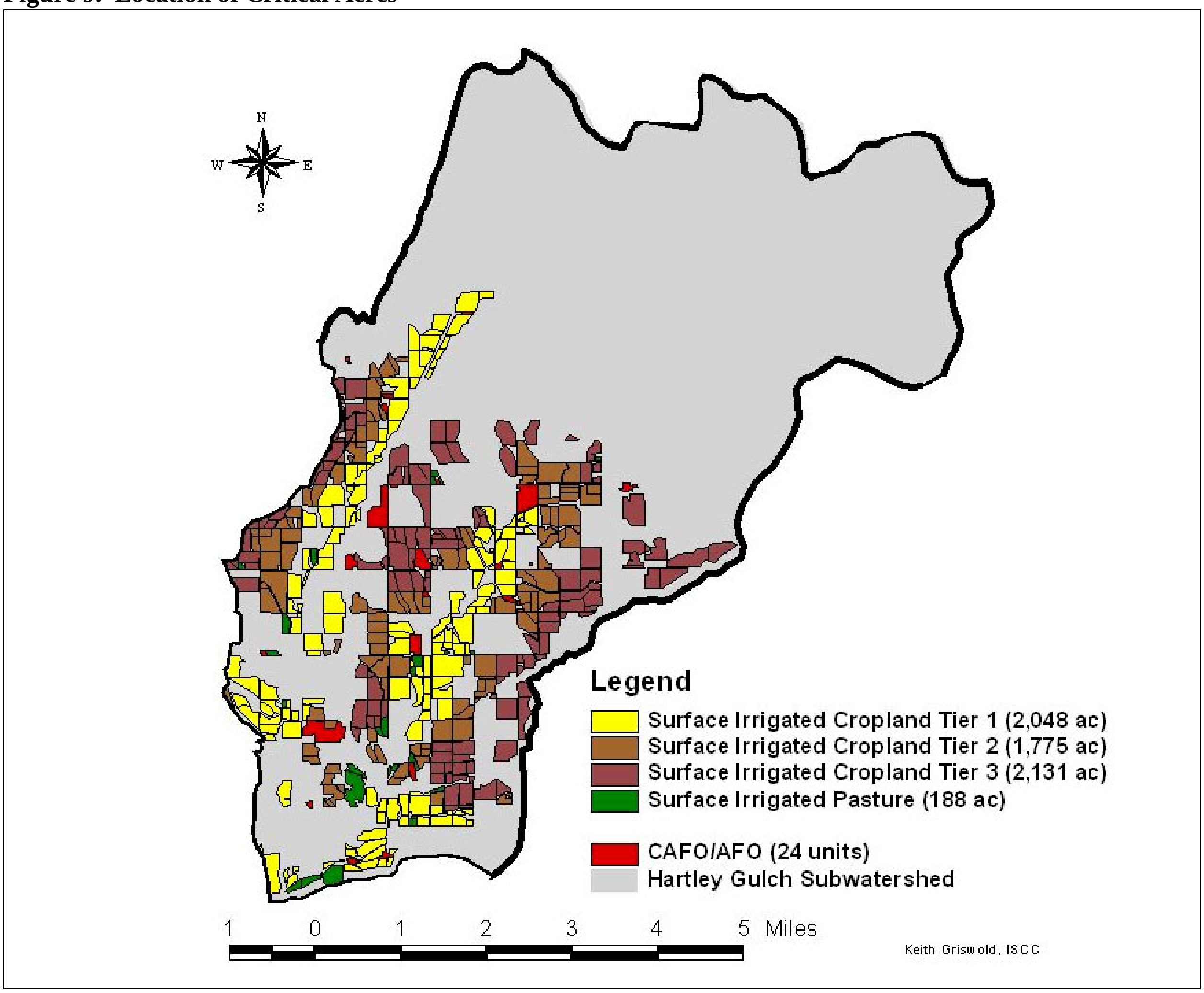
6.0 Identification of Critical Acres

An initial watershed inventory was completed to determine the land areas that affect Hartley Gulch. Aerial photos, topographic maps and field investigations were all utilized to determine the land areas that impact the water quality of Hartley Gulch, which affects the Lower Boise River.

Drainage ditches, irrigation supply canals, topography transitions, and roads determine the route of the irrigation wastewater and natural drainage. Irrigation wastewater flows can be intercepted by the canals, drains or reused by neighboring farms, then in turn be reused or intercepted by other drains or canals.

Land treatment though BMP installation will be pursued in three tiers. Agricultural lands that drain directly into Hartley Gulch will be a Tier 1, high priority for treatment because these lands have the most immediate impact on Lower Boise River water quality. Drainage water from Tier 2 lands is reused once on Tier 1 lands before discharging to the Hartley Gulch, and are given a medium priority for treatment. Tier 1 & 2 acres are the Critical Acres within Treatment Unit 2. Drainage water from Tier 3 lands is reused multiple times on Tier 1 and Tier 2 lands before discharging to the Hartley Gulch, and are given a low priority for treatment.

Figure 9. Location of Critical Acres



Critical Acres within each Treatment Unit:

Treatment Unit 1	No critical acres within this unit
Treatment Unit 2	2,048 acres of Tier 1 surface irrigated cropland 1,775 acres of Tier 2 surface irrigated cropland 2,131 acres of Tier 3 surface irrigated cropland
Treatment Unit 3	188 acres of surface irrigated pasture
Treatment Unit 4	No critical acres within this unit
Treatment Unit 5	24 units of CAFO/AFO

7.0 Implementation Plan BMPs

Agricultural conservation and soil erosion practices are typically referred to as Best Management Practices (BMPs). These practices are nationally derived systems to control, reduce, or prevent soil erosion and sedimentation on agricultural landuses (APAP, 1991). BMPs are selected to reduce irrigation-induced and streambank erosion, contain and filter sediment, nutrients, and bacteria from irrigation wastewater, contain and properly dispose of animal wastes, and reduce leaching of nutrients and pesticides. This will improve the quality of surface waters in the project area and reduce pollutant loading to the Lower Boise River. The status of the beneficial uses for these waters will be maintained or improved with the implementation of this alternative.

BMPs include, but are not limited, to the following:

Table 8. Treatment Unit 2---Surface Irrigated Cropland

Agro-Tillage	Conservation Cropping Sequence
Conservation Tillage	Cover and Green Manure Crop
Filter Strips	Grassed Waterway
Surge Irrigation System	Sprinkler Irrigation System
Tailwater Recovery System	Irrigation Water Management Systems
Straw Mulching	Nutrient Management
Pest Management	Sediment Basin
Underground Outlet	Chiseling and Subsoiling
Waste Utilization	Channel Vegetation
Drip Irrigation System	PAM
Irrigation Water Conveyance	

Table 9. Treatment Unit 3---Surface Irrigated Pasture

Fencing	Stream channel stabilization
Heavy use area protection	Offsite watering
Filter strips	Waste Utilization
Spring water development	Waste Storage System
Irrigation systems	Nutrient Management
Pasture and Hayland Planting	Planned Grazing System
Livestock Watering Facility	Pasture and Hayland Management

Table 10. Treatment Unit 5---CAFO/AFO

Waste Management System	Heavy use area protection
Filter strips	Livestock Watering Facility
Nutrient Management	Fencing

7.1 Example Description of Alternatives for Surface Irrigated Cropland

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

SITE SPECIFIC BMP Alternative #1 ($800/ acre)	**SITE SPECIFIC BMP Alternative #2 ($500/ acre)**	**SITE SPECIFIC BMP Alternative #3 ($250/ acre)**
Irrigation Water Mgt. Sprinkler Irrigation System Nutrient Mgt. Conservation Crop Rotation	Irrigation Water Mgt. Land Leveling Surface Irrigation System Gated Pipe Tail Water Recovery System Nutrient Mgt. Conservation Crop Rotation Conservation Tillage	Irrigation Water Mgt. Concrete Ditch Filter Strip PAM Sediment Basin Nutrient Mgt. Conservation Crop Rotation Conservation Tillage

EVEN ← MAINTENANCE → EVEN
HIGH ← RELATIVE COST → LOW
IMMEDIATE ← TIME TO MEET WATER QUALITY GOALS → EXTENDED
LOWER LABOR ← ASSOCIATED BENEFITS → HIGHER LABOR

ALTERNATIVE SELECTED BY <u>LANDOWNER</u> BASED ON OBJECTIVES AND CAPABILITIES

↓

FINAL DESIGN OF BMP

↓

BMP INSTALLED

↓

FEEDBACK LOOP – IMPLEMENTATION AND EVALUATION MONITORING

↓

IF WATER QUALITY GOALS NOT MET – ADJUST BMP TO MEET WATER QUALITY GOALS

(APAP, 1991)

7.2 Example Description of Alternatives for Surface Irrigated Pasture

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

SITE SPECIFIC BMP Alternative #1 ($450/ acre)	**SITE SPECIFIC BMP Alternative #2 ($350/ acre)**	**SITE SPECIFIC BMP Alternative #3 ($250/ acre)**
Fencing Planned Grazing System Pasture & Hayland Mgt. Nutrient Mgt. Heavy Use Area Protection Livestock Watering Facility Irrigation Water Mgt. Field Border Irrigation System Gated Pipe	Fencing Planned Grazing System Pasture & Hayland Mgt. Nutrient Mgt. Livestock Watering Facility Irrigation Water Mgt. Field Border Irrigation System	Fencing Pasture & Hayland Mgt. Nutrient Mgt. Livestock Watering Facility Irrigation Water Mgt. Field Border Irrigation System

7.3 Example Description of Alternatives for CAFO/AFO

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

SITE SPECIFIC BMP Alternative #1 ($50,000/ each)	**SITE SPECIFIC BMP Alternative #2 ($35,000/ each)**	**SITE SPECIFIC BMP Alternative #3 ($25,000/ each)**
Nutrient Mgt. Heavy Use Area Protection Livestock Watering Facility Filter strips Waste Mgt. System Dike	Waste Mgt. System Nutrient Mgt. Livestock Watering Facility Filter strips Heavy Use Area Protection	Waste Mgt. System Nutrient Mgt. Filter strip Heavy Use Area Protection

7.4 BMP Costs

Due to the variability in agriculture, these prices per acre are best professional judgement. With changes in technology, land ownership, crops, agricultural commodities, landuse, and public perception, these costs and acres will change.

Lower cost BMPs are usually temporary in nature and do not address underlying issues relating to irrigation systems and irrigation water management. The yearly maintenance and labor cost of Alternative 3 BMPs are higher than those for Alternative 1 BMPs.

7.5 Feedback Loop

The feedback loop a process to evaluation and refinement of BMPs. The feedback loop occurs in four steps:

1. The process begins by developing water quality criteria to protect the identified beneficial uses of the water resource.
2. The existing water quality as compared to the water quality criteria established in Step 1, is the basis for developing or modifying BMPs.
3. The BMP is implemented on-site and evaluated for technical adequacy of design and installation.
4. The effectiveness of the BMP in achieving the criteria established in Step 1 is evaluated by comparison to water quality monitoring data. If the established criteria are achieved, the BMP is adequate as designed, installed and maintained. If not, the BMP is modified and the process of the feedback loop continues.

Implementing the feedback loop to modify BMPs until water quality standards are met results in full voluntary compliance with the standards. (APAP, 1991)

8.0 Program of Implementation

Canyon Soil Conservation District have selected land treatment through application of a combination of BMPs including improved irrigation systems, nutrient and sediment control systems, and management practices. Significant contribution by agricultural land users in the Hartley Gulch Subwatershed toward achieving the TMDL's objectives of protecting aquatic life and recreational uses of the Lower Boise River by reducing the discharge of sediments and bacteria from the Hartley Gulch to the Snake River.

8.1 Installation and Financing

The USDA Natural Resources Conservation Service (NRCS) is the technical agency that will assist the Idaho Soil Conservation Commission (ISCC), Gem SWCD, and Canyon SCD in developing water quality plans and designs. BMPs will be installed according to standards and specifications contained in the NRCS Field Office Technical Guide. NRCS and ISCC will assist Canyon SCD with certification of installed BMPs, filing payment applications, completion of annual status reviews on contracts, annual development of an average cost list, and will provide any needed follow-up assistance such as that required for contract modification.

Each participant will be responsible for installing the BMPs scheduled within their contract as planned in the Conservation Plan. Any needed land rights, easements or permits necessary for construction and inspection will be the sole responsibility of the participant. Each participant will also be required to make their own arrangements for financing their share of installation costs.

Table 11. Estimated BMP Cost Summary for Treatment Unit 2, Tier 1 (Surface Irrigated Cropland—2,048 acres).

ALTERNATIVE		ACRES	TOTAL COSTS
Alternative 1	$800/AC	2048	$ 1,638,400
Alternative 2	$500/AC	2048	$ 1,024,000
Alternative 3	$250/AC	2048	$ 512,000

Table 12. Estimated BMP Cost Summary for Treatment Unit 2, Tier 2 (Surface Irrigated Cropland—1,775 acres).

ALTERNATIVE		ACRES	TOTAL COSTS
Alternative 1	$800/AC	1775	$ 1,420,000
Alternative 2	$500/AC	1775	$ 887,500
Alternative 3	$250/AC	1775	$ 443,750

Table 13. Estimated BMP Cost Summary for Treatment Unit 2, Tier 3 (Surface Irrigated Cropland—2,131 acres).

ALTERNATIVE		ACRES	TOTAL COSTS
Alternative 1	$800/AC	2131	$ 1,704,800
Alternative 2	$500/AC	2131	$ 1,065,500
Alternative 3	$250/AC	2131	$ 532,750

Table 14. Estimated BMP Cost Summary for Treatment Unit 3 (Surface Irrigated Pasture 188 acres).

ALTERNATIVE		ACRES	TOTAL COSTS
Alternative 1	$450/AC	188	$ 84,600
Alternative 2	$350/AC	188	$ 65,800
Alternative 3	$250/AC	188	$ 47,000

Table 15. Estimated BMP Cost Summary for Treatment Unit 5 (CAFO/AFO 24 Units).

ALTERNATIVE		UNITS	TOTAL COSTS
Alternative 1	$50,000/each	24	$ 1,200,000
Alternative 2	$35,000/each	24	$ 840,000
Alternative 3	$25,000/each	24	$ 600,000

8.2 Operation, Maintenance, and Replacement

Participants will be responsible for maintaining the installed BMPs for the life of their contract. The contract will outline the responsibility of the participant regarding operation and Maintenance (O&M) for each BMP. Technical assistance for BMPs will be provided by NRCS and ISCC.

Inspections of installed BMPs will be made on an annual basis by Canyon SCD, Gem SWCD, NRCS, ISCC, and the participant during the life of the contract. The intent is to develop a system of BMPs that will protect water quality and is socially and economically feasible to the participant. By accomplishing this objective, it is intended that the BMPs will become a part of the participant's farming operation and will continue to be operated and maintained after the contract expires.

8.3 Water Quality Monitoring

The ISDA has is collected water quality samples in Hartley Gulch Subwatershed for 2001 irrigation season. Most samples were collected on a bimonthly basis throughout the irrigation season (April - October) and on a monthly basis throughout the rest of the year (winter). Data parameters measured thus far have included DO (dissolved oxygen), temperature, % saturation, conductivity, TDS (total dissolved solids) pH, discharge (cfs), TSS (total suspended solids), TVS (total volatile solids), nitrate/nitrite, TP (total phosphorus), OP (dissolved ortho-phosphorus), fecal coliform, and E-coli. U.S. Geological Survey (USGS) has been monitoring the major tributaries to the river at their mouths since 1993 and will continue until April 2000. Sampling frequency has been upgraded to bimonthly for the subwatershed starting in April of 1999, then sampled monthly through the winter period.

ISDA along with the ISCC and the Idaho Association of Soil Conservation Districts (ISACD) will develop a water quality monitoring plan that will allow trend analysis of water quality and gauge progress toward meeting the TMDL load reductions. The proper time to revisit the subwatershed for evaluation of water quality improvements will be decided through joint agency cooperation, data review, and BMP implementation evaluation. This could be based on a number of factors including percent of critical acres treated, number of major contributors treated, or a specific time interval.

9.0 References

U. S. Department of the Agriculture, Soil Conservation Service (Natural Resource Conservation Service). 1972. *Soil Survey of Canyon County, Idaho*

David F. Ferguson, Idaho Soil Conservation Commission, 1999. *Lower Boise River Drainage Delineation, Technical Report*

Bureau of Reclamation, 1996. *A Description of Bureau of Reclamation System Operation of the Boise and Payette Rivers*

Lower Boise River TMDL, 1998. *Subbasin Assessment, Total Maximum Daily Loads*

Idaho Department of Health & Welfare Division of Environmental Quality and Idaho Department of Lands Soil Conservation Commission 1991. *Idaho Agricultural Pollution Abatement Plan (APAP).*

Keith Griswold, Idaho Soil Conservation Commission, 2001. *Farm Services Agency Data*